

BASTIDE et al.
Appl. No. 10/581,342
Attny. Ref.: 5006-10
Amendment
Monday, August 2, 2010

AMENDMENTS TO THE CLAIMS:

Please amend the claims as follows:

1. (Currently Amended) A spray pyrolysis method, characterized in that it is applied to for the synthesis of closed-structure nanoparticles with a closed structure of metal chalcogenides having a lamellar crystallographic structure, of the general formula (I) M_aX_b , in which M represents a metal and X a chalcogen, a and b representing the respective proportions of metal and of chalcogen, and in that it comprises said method comprising the steps of:

(a) providing a solution of at least one precursor of formula (II) $(A)_cM(X)_d$ dissolved in a solvent,

(b) providing a liquid aerosol by atomizing the solution obtained in step a) into fine droplets in suspension in an inert carrier gas, and

(c) pyrolyzing the liquid aerosol obtained in step c);

wherein, in formulas (I) and (II):

A represents a cation,

M represents a transition metal or a metal from group III, IV or V of the periodic table of the elements,

X represents a chalcogen selected from oxygen, sulfur, selenium and tellurium, a and b each represents the proportion of metal and of chalcogen, respectively, in formula (I),

c and d each represents the proportion of cations and of chalcogens, respectively, in formula (II),

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M and X represent a metal and a chalcogen, respectively, of a metal

chalcogenide M_aX_b having a lamellar crystallographic structure~~pyrolysis of a liquid aerosol obtained from a solution of at least one precursor of a metal (M) and of a chalcogen (X), or of at least one precursor of said metal (M) and of at least one precursor of said chalcogen (X), dissolved in a solvent, said solution being atomized into fine droplets in suspension in a carrier gas.~~

2. (Currently Amended) The method as claimed in claim 1, characterized in that it comprises said method comprising the following steps:

[-]formation of a solution of said at least one precursor of formula (II)a metal and of a chalcogen, or of said at least one precursor of said metal and of said at least one precursor of said chalcogen in a solvent,

[-]atomization of said solution in liquid aerosol form by a nebulizer, ~~in particular of the pneumatic or ultrasonic type~~, through which the carrier gas is flowing,

[-]injection of the aerosol into a heated furnace to evaporate the solvent and to react and/or break down said precursor(s) of the metal and of the chalcogen at least one precursor of formula (II) so as to form the nanoparticles,

[-]transport by the carrier gas of the nanoparticles to the furnace outlet, and

[-]recovery of the nanoparticles at the furnace outlet.

Claim 3. (Canceled)

4. (Currently Amended) The method as claimed in claim [[3]]1, characterized in that said precursor is of the formula $(A)_eM(X)_d$ in whichwherein A is a cation such as K^+ ,

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~~Na⁺ or NH₄⁺, M is a metal and X a chalcogen, c and d respectively representing the number of cations and chalcogens.~~

5. (Currently Amended) The method as claimed in claim 1, characterized in that said metal M is a transition metal selected from among Ti, Zr, Hf, V, Nb, Ta, Mo, W, Re, Co, Ni, Pt, Pd, Cr and Ru.

6. (Currently Amended) The method as claimed in claim 1, characterized in that said metal belongs to group III of the Periodic Table of Elements, such as wherein M is Ga [[and]] or In.

7. (Currently Amended) The method as claimed in claim 1, characterized in that said metal is a metal from group IV of the Periodic Table of Elements, in particular wherein M is Sn, Pb or Ge.

8. (Currently Amended) The method as claimed in claim 1, characterized in that said metal is a metal from group V of the Periodic Table of Elements, such as wherein M is Bi.

Claim 9. (Canceled)

10. (Currently Amended) The method as claimed in claim 4, characterized in that said precursor wherein said at least one precursor of formula (II) is a tetrathiometallate or a tetraselenometallate.

11. (Currently Amended) The method as claimed in claim 10, characterized in that the metal wherein M is molybdenum or tungsten.

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12. (Currently Amended) The method as claimed in claim 1, ~~characterized in that wherein~~ said carrier gas is an inert gas selected from nitrogen and argon and/or hydrogen.

13. (Currently Amended) The method as claimed in claim 1, ~~characterized in that wherein~~ said solvent is a polar solvent, ~~in particular water and/or ethanol.~~

14. (Currently Amended) The method as claimed in claim 1, ~~characterized in that wherein~~ said nanoparticles are nanotubes, fullerenes and/or nanoboxes.

15. (Currently Amended) Nanoparticles of metal chalcogenides having the formula MX_2 , ~~characterized in that they have obtainable by the method of claim 1, said nanoparticles having~~ the form of nanoboxes made up of closed, generally hollow right rectangular parallelepipeds and rectangles, ~~wherein M represents a transition metal or a metal from group III, IV or V of the periodic table of the elements, and X represents a chalcogen selected from oxygen, sulfur, selenium and tellurium.~~

16. (new) The method as claimed in claim 2, wherein the nebulizer is a pneumatic or ultrasonic type nebulizer.

17. (new) the method as claimed in claim 13, wherein the solvent is water, ethanol, or a mixture thereof.